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UNIVERSITY OF FLORIDA

Center for Aquatic Weeds

AQUAPHYTE

International Plant Protection Center

AQUATIC WEED PROGRAM



VOLUME 3 NUMBER 1

GAINESVILLE, FLORIDA

SPRING 1983

A SUCCESSFUL INFORMATION SYSTEM

The following is a brief description of an increasingly popular service provided by the University of Florida Center for Aquatic Weeds: the aquatic plant information and retrieval system. The goal of this system is to assemble in one place all printed information on aquatic plants, and to make the collection available to aquatic systems researchers world-wide. The collection includes information about aquatic plant biology and ecology, about methods of control of nuisance plants, and information on how to utilize aquatic plants for pollution control, energy production, food products and so on. The collection is the result of the interest and cooperation of hundreds of researchers and research centers who have contributed thousands of reprints, reports and other aquatic plant information to the Center since this service began a few years ago.

The system uses computer technology to produce quickly printed bibliographic lists of references in the collection (the "database"). These lists ("printouts") are produced according to the researchers' own specified interests. This is evidently the only computerized library anywhere devoted to aquatic plants.

The system provides "current awareness" information services to more than 600 researchers on a regular basis and several hundred more on an occasional basis. Universities, research centers, government agencies and private organizations in more than sixty countries are among users of this system.

As of this writing, the database has over 15,000 items. Approximately 200 items per month are added to the database.

The following are some particulars of the aquatic plant information and retrieval system.

THE SCOPE AND "RULES" OF THE COLLECTION

We collect as many reprints, reports and books as possible which discuss any aspect of aquatic plant biology, ecology, control or utilization. Sometimes an item is about specific aquatic plants and their titles make this clear. Sometimes the item is about a group of aquatic plants, or about an ecosystem in which aquatic plants are affected by some condition or another. Sometimes the item is about an insect, fish, bird or other organism which either lives in, on or about aquatic plants. Sometimes the item is a survey of plants in a particular area or river or lake. **The rule is:** any information we receive

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AQUATIC HERBICIDES EVALUATED

Dr. Thai K. Van is a man with lots of jars; hundreds of jars filled with water leafy plants growing in each, all attached to a maze of plastic tubing. Valves and pumps click and hum. Sometimes there are small pellets next to the plants, sometimes "strings" hang among the plants, and sometimes the water is colored or cloudy. These are aquatic herbicide screening tests.

In many places, hydrilla, water hyacinth, watermilfoil, lagarosiphon, salvinia and many other species of aquatic plants have had serious, some say "profound", effects on commerce, health and agriculture. Certain environmental conditions can cause them to suddenly outgrow other water plants. In fact, they literally choke many of the world's lakes and rivers. These weeds halt boat and barge traffic, disrupt the functioning of irrigation and flood control projects and hydroelectric power plants, provide homes for disease carrying mosquitoes and snails, and alter aquatic ecosystems by preventing sunlight from reaching other plants and animals which live beneath their mats. And they have "ruined the fishing" in any number of places.

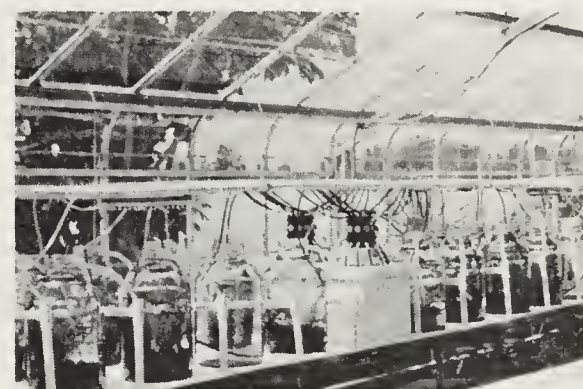
Aquatic weeds are controlled by several methods. Heavy machines provide mechanical control, many kinds of insects, pathogens and other organisms provide biological control, and drawdowns, plastic sheets and colored dyes provide cultural control. However, chemical control continues to be the most common method. Many herbicides and their various "formulations" are approved for aquatic use by the U.S. Environmental Protection Agency. However, old and new herbicides are subject to continuous testing for their effectiveness and safety. With partial funding from the U.S. Army Corps of Engineers and in cooperation with Dr. Vernon Vandiver and other University of Florida faculty, U.S.D.A.'s Dr. Van performs many of these tests.

Dr. Van's screening tests help determine the fate of a considerable number of chemical compounds which might eventually be used to control aquatic weeds. Currently, Dr. Van is evaluating various "controlled release" herbicides for aquatic weed control. Test results are provided to companies which produce aquatic herbicides and to government agencies which oversee water resources.

Plants and herbicides are subjected to three phases of screening tests. Data collected from these tests give information, on the effects of a herbicide on its "target plant" (its "efficacy") as well as effects on "non-target organisms" such as other

plants and animal life. Tests also give information on a herbicide's effects on water quality and on how long it takes for its chemical structure to break down (its "degradation rate") and be absorbed into the immediate environment. In cases of controlled-release formulations, these tests also determine a herbicide's "release rate" and its "constancy" or "reliability". Approximately 20 herbicides per year are screened by Dr. Van.

In the "primary screen", plants are grown and herbicides are applied in closed systems similar to the one pictured here.



Changing a variety of conditions (herbicide concentration, water temperature and flow rate, light conditions, etc.) gives Dr. Van some of the information he needs. He wants to know the effects of variable environmental conditions on the plants and herbicides under study.

In the second phase, plants are grown in larger closed outdoor systems such as the "kiddie swimming pools" and concrete tanks pictured here.



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INFORMATION SYSTEM

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which discusses in detail or refers to specific aquatic plants or groups of aquatic plants are catalogued and added to the database. This is one reason researchers should be as specific as possible when requesting searches of the database.

The database was originally designed to be about freshwater plants, excluding algae. (There are some "algae" items in the database, most of which have been recently contributed, but we do not seek algae citations at this time.) However, some plants occur in brackish and salt water, and some of them are included in this database. There have been many contributions to the database which are about a few salt marsh and brackish water plants. Because of the apparent interest, the database has been expanded to include these plants. Most notable among them are *Spartina*, *Distichlis*, *Thalassia*, *Syringodium*, *Zostera* and *Ruppia* species. **The rule is:** any information which has to do with freshwater plants and salt marsh or brackish water plants will be catalogued and added to the database.

Water plants might be defined as plants which live some or all of their lives in water. This definition would include plants which live in lake and river beds as well as plants which live on the immediate shore of the water body, or which thrive in areas which often are flooded. **The rule is:** any information on plants which are described as living in water bodies, on the near-shore or in flood prone areas (such as marshes and swamps), will be catalogued and added to the database.

REFEREED OR NOT

The collectors for the database make no judgements as to the scientific method or validity of work described in items in the database. All information received which appears to be about aquatic plants is added to the database. Reports are denoted as reports, a master's thesis is called a master's thesis, and so on. A researcher wanting a list only from "refereed" journals should specify the journals required or simply pass over the citations in a printout which are not from refereed journals. There are no newspaper reports of aquatic plants included in the database.

ADDRESSES

Addresses of authors cannot be included in the computer database because of the extra memory, typing and computing costs which would result. Addresses of most authors cited can be supplied by this service upon request.

SOURCES FOR INFORMATION

We identify citations through many sources. However, our largest supplier of information on aquatic plants is the researchers themselves. Most of the items listed in this database have been contributed by their authors. In addition, we scan many journals and proceedings, as

well as the "Literature Cited" lists found in most books and articles for relevant citations. We also search for citations in more than a dozen other computer databases, none of which is dedicated to aquatic plants but which include some aquatic plant items. We also have exchange agreements with many aquatic resource research centers throughout the world whose publications lists we scan for relevant items. When a relevant item is identified, we obtain the item from its author, from the research center or from other library sources.

THE COLLECTION

Most of the articles and books cited are actually in the collection. However, some of the actual articles and books have not been located. We include some citations for items we do not have in the belief that some information shared to our users is better than none. Items marked (Abstract) or (Citation Only) in the printouts indicate that we do not actually have the cited item on file. We would be pleased if users of the system who recognize items that they have but which we are lacking will contribute copies to the collection.

SUPPLYING REPRINTS

In some cases, we will supply hard-to-find items to cooperating users of the system. Because of our limited resources, we expect users to attempt to locate the required items through their own local research libraries. For those who are unable to do so, this office will make every effort to supply the required items subject to international copyright laws which might apply. We ask that those users requesting reprints be judicious as to the number of reprints they request.

ERRORS

The creation of a database also means making typing and factual errors. Names might be misspelled, categories may not be exactly right, keywords may be misleading, translations may be incorrect or page numbers may be left out. When errors are spotted by users of the system, please bring them to our attention.

LANGUAGES

Items in the database are written in at least 20 languages. Where possible, citation information has been translated into English. All items can be presumed to be in English, unless otherwise noted in the printouts.

"INTERACTIVE" AND "BATCH" MODES

For reasons of economy, computer services we provide are carried out in "batch mode". This means that to receive a printout, users must make their request in writing. Our database is not accessible "interactively", that is, researchers with their own computer terminals cannot "call up" our computer and conduct searches themselves.

TURNAROUND TIME

In most cases, results of requested

searches (printouts) are on their way to the user within 24 hours of our receiving the request.

UPDATES

"Current awareness updates" to bibliographies are provided to those who request them. "Updates" consist of items recently entered into the system. They are produced and mailed to users every five months.

Below is a list of plants most often the subject of searches in the database. Also listed is the approximate number of citations in the database for the plant as of March, 1983.

<i>Alternanthera philoxeroides</i>	450
<i>Azolla pinnata</i>	150
<i>Brasenia schreberi</i>	130
<i>Cabomba caroliniana</i>	135
<i>Ceratophyllum demersum</i>	710
<i>Eichhornia crassipes</i>	1,500
<i>Elodea canadensis</i>	650
<i>Hydrilla verticillata</i>	600
<i>Juncus effusus</i>	120
<i>Lagarosiphon major</i>	60
<i>Lemna minor</i>	625
<i>Myriophyllum spicatum</i>	750
<i>Najas guadalupensis</i>	250
<i>Nelumbo lutea</i>	100
<i>Nuphar advena</i>	130
<i>Nymphaea odorata</i>	150
<i>Phragmites communis</i>	550
<i>Pistia stratiotes</i>	400
<i>Polygonum amphibium</i>	120
<i>Pontederia cordata</i>	150
<i>Potamogeton pectinatus</i>	600
<i>Ranunculus aquatilis</i>	100
<i>Sagittaria latifolia</i>	150
<i>Salvinia molesta</i>	125
<i>Scirpus validus</i>	150

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UNIVERSITY OF FLORIDA
AQUAPHYTE
Center for Aquatic Weeds
International Plant Protection Center
AQUATIC WEED PROGRAM



VOLUME 2 NUMBER 1 GAINESVILLE, FLORIDA SPRING 1983

Newsletter of the Center for Aquatic Weeds and the IPPC Aquatic Weed Program of the University of Florida. The Center for Aquatic Weeds is in the Institute of Food and Agricultural Sciences (IFAS). The International Plant Protection Center (IPPC) is a unit of Oregon State University and is funded by the United States Agency for International Development.

Editor: Victor Ramey

AQUAPHYTE is distributed to three thousand aquatic biologists and agencies world-wide. Comments, announcements, news items and other information relevant to aquatic plant research are solicited.

We gladly permit free republication of **AQUAPHYTE** items when accompanied by full acknowledgement. Views and interpretations in this publication are not attributable to the U.S. Agency for International Development nor any individual acting in their behalf. Inclusion in **AQUAPHYTE** does not constitute endorsement nor should exclusion be interpreted as criticism of any item, firm or institution by IPPC, the University of Florida or AID.

AQUATIC HERBICIDES EVALUATED

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This phase more closely approximates those conditions in the field. In this phase, more information is gathered on the herbicide's properties and its effects on the target plant, other plants, aquatic insects, fish, snails and plankton which are also introduced into the systems.

In the final phase, the herbicide is introduced into field conditions (ponds, lakes and rivers). Data collected in this phase are compared to data from the previous test phases.

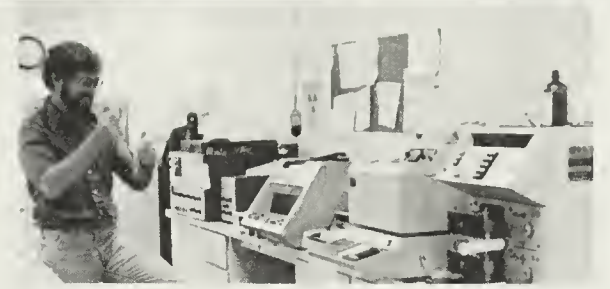
From the time Dr. Van receives a herbicide to be screened until the time he can report on its effects, many months will lapse. This is because to test a six-month-time-released herbicide, for instance, requires many six-month cycles; to test the effects of a herbicide on the different stages in a plant's life requires allowing the plant to live out its cycle. To test the effects of temperature, flow-rate and so on requires additional time. Because Time and Mother Nature cannot be hurried, herbicide screening is an especially long process.

Many combinations with species and environmental variables are studied before a herbicide is deemed safe and effective for

the control of aquatic weeds. Dr. Van and his counterparts throughout the world will continue these and other tests in the battle to make all our water resources useful, healthy and productive again.



Controlled release herbicide "strings" in hydrilla.



One of Dr. Van's assistants prepares a water sample for analysis.



Dr. Van shows some screening results to Dr. Kenneth Langeland.

Dr. T.K. Van is a U.S. Department of Agriculture scientist at the Agricultural Research and Education Center in Fort Lauderdale, Florida. He is a plant physiologist who has studied the photosynthetic and photorespiratory properties of many aquatic plants. His specialty is the effects of herbicides, especially "controlled release" herbicides, on hydrilla and water hyacinth.

Dr. Van lives in Fort Lauderdale with his wife, Mai, and their two daughters.

AQUATIC WEED RESEARCH IN FLORIDA

The last AQUAPHYTE highlighted the faculty and research projects being conducted at the Center for Aquatic Weeds in Gainesville. However, the University of Florida (IFAS) has over 20 "Research Stations" located throughout the state where scientists conduct research on many diverse agricultural problems. Among them is the Agricultural Research and Education Center (AREC) in Ft. Lauderdale.

The activities of AREC-Ft. Lauderdale are directed by Dr. William B. Ennis, well known weed scientist and former administrator with the U.S. Department of Agriculture, Agriculture Research Service. Major research conducted at AREC-Ft. Lauderdale is in ornamental horticulture, fastidious vascular diseases, Formosan termites, turf grasses, and aquatic plants.

Aquatic weed control is a "most challenging and complicated research area," according to Dr. Ennis. Each of the various methods of control can have undesirable consequences depending on the time and place of use. Control effects on other plants and animals, on water quality, in short, on the entire aquatic ecosystem, must be understood. Otherwise, controlling the weeds might cause other problems of equal enormity. In addition, controls might only temporarily control target plants, requiring repeated application. The economic costs can be huge. These are some of the reasons, Dr. Ennis says, that achieving a "balance" (controlling a plant without severely affecting the rest of the aquatic ecosystem) can be very difficult indeed. He also notes that there are very few scientists anywhere working in this complex area of research, but adds, "we've got to keep working at it."

Aquatic Plant research at Ft. Lauderdale is conducted in cooperation with the U.S. Department of Agriculture (USDA) scientific staff located at AREC. This combined federal and state research effort includes:

- *Herbicide screening
- *Foreign exploration for biocontrol insects
- *Plant competition studies
- *Nutrient and hydrosol studies
- *Studies on Hydrilla reproduction
- *Biomass and aquatic plant "biofilter" projects
- *Studies on hybrid and grass carp.

Aquatic plant scientists located at the AREC are K.K. Steward, USDA-plant physiologist; T. Center, USDA-entomologist; and T.K. Van, USDA-plant physiologist. University of Florida aquatic plant scientists include D.L. Sutton, plant physiologist; J. Balciunas, entomologist; T. Batterson, plant ecologist; and V. Vandiver, extension specialist. This issue of AQUAPHYTE briefly describes some of the herbicide research conducted by T.K. Van and other AREC scientists. Future issues will describe work by other AREC scientists. For further information, the address is: Agricultural Research and Education Center, 3205 S.W. 70th Avenue, Ft. Lauderdale, Florida 33314, U.S.A.



Dr. William B. Ennis, Director, Agricultural Research and Education Center, Ft. Lauderdale, Florida, USA

INFORMATION SYSTEM

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Spartina alterniflora	250
Spirodela polyrhiza	225
Trapa natans	125
Typha latifolia	525
Utricularia vulgaris	125
Vallisneria americana	175
Wolffia columbiana	100
Zannichellia palustris	150
Zizania aquatica	150
Zostera marina	175

Hundreds more aquatic plant species are also cited in the database.

Below is listed the retrieval categories for the database. Next to each main category is a number which indicates the approximate number of citations retrievable from that category as of March, 1983.

PLANT NAME(S)

BIOLOGICAL CONTROL (2200)

- Animals
- Fish
- Insects
- Manatee
- Pathogens
- Plants
- Snails

CHEMICAL CONTROL (3100)

- Chemical Name

CULTURAL CONTROL (225)

- Water Level
- Fertilization
- Shading

DISTRIBUTION -- COUNTRIES (5000)

ECOLOGY (8300)

- Lakes (Ponds)
- Reservoirs
- Wetland
- Marshes (Bogs, Swamps)
- Rivers (Streams, Irrigation Canals, Channels)
- Estuaries (Bay)
- Primary Production
- Productivity
- Eutrophication
- Pollution (Toxicology)
- Nutrient Cycling
- Plant Succession
- Host Plants
- Herbicides
- Ecosystem
- Government Control
- Phenology
- Water Chemistry
- Water Quality

ECONOMICS (250)

INTEGRATED CONTROL (120)

KEYWORDS

MECHANICAL CONTROL (525)

- Mowing
- Dredging

MORPHOLOGY (2300)

- Cytology
- Embryology
- Histology

PHYSIOLOGY (3200)

- Photosynthesis
- Transpiration

REMOTE SENSING (100)

REPRODUCTION (1100)

- Flowering
- Germination
- Ontogeny

REVIEW (600)

SURVEY (550)

TAXONOMY (1100)

TOXIC PLANTS (60)

UTILIZATION (1200)

- Biogas
- Food
- Pollution Control

HOW TO ORDER A BIBLIOGRAPHY

Researchers should make specific requests for searches. Some categories are hundreds of citations in length. Therefore, when ordering bibliography searches, users should combine categories and keywords with plant species of particular interest, such as:

- **Eichhornia crassipes* and chemical control
- *Heavy metal uptake in any aquatic plant
- **Azolla* as a green manure
- *Triploid studies since 1978 in herbivorous fishes
- *Salinity tolerance in *Spartina alterniflora*
- *Productivity of *Phragmites* in lakes
- *Everything in the database on *Lemna*

A plant species search of the database yields a printout of citations in which the plant is the primary subject as well as citations in which the plant is mentioned prom-

inently in the text. The printout also includes citations of surveys and reviews in which the plant is cited.

KEYWORDS -- ANY WORDS CAN BE SEARCHED AS KEYWORDS IN THE TITLES AND IN THE KEYWORDS CATEGORY OF THE DATABASE. Examples are:

- | | |
|--------------------|------------------------|
| *water level | *cadmium |
| *biomass | *elemental composition |
| *nitrogen fixation | *epiphyte |
| *2,4-d | *protein |

A keyword search of the database yields a printout of citations which have the keyword(s) in their titles or in their keywords lists, lists which include any keywords suggested by the authors as well as keywords given to the articles by this office. In a search, keywords are sometimes abbreviated so as to retrieve all forms of the keyword. For example, "epiphyt" will retrieve the words "epiphyte", "epiphyton" and "epiphytic". Because there is no standard keyword list for the literature and there are synonyms for many keywords, some search requests are altered so as to retrieve more relevant information for the user. The user should also suggest synonyms for keywords which they wish to have searched.

Bibliographies can also be produced according to authors or co-authors cited in the database. Please provide the full names and correct spellings for author and co-author searches.

ALL BIBLIOGRAPHIES ARE PRINTED IN ALPHABETICAL ORDER ACCORDING TO PRIMARY AUTHOR.

FRENCH WATER INFORMATION SYSTEM

THE ASSOCIATION FRANCAISE POUR L'ETUDE DES EAUX (AFEE) maintains the National Center of Documentation and Information for Water. The AFEE database is a computerized collection of more than 40,000 published references on water. The system was set up in 1949 and adds about 4,800 documents annually to its database. References are collected from 350 journals and proceedings of conferences, congresses and symposia. Citations also include indicative micro-summaries of the contents of the documents. Dissemination of the references is through the bulletin "Information-Eaux" and through the "profile file" published quarterly on cards. Dissemination is also accomplished by on-line searches of their database which can be accessed via computer terminal through the SPIDEL service. The database permits searching by descriptors as well as by the text of the micro-summaries. The contents of the database is grouped under 10 main headings:

- A) Water resources and demands
- B) Water treatment
- C) Pollution of water and soil
- D) Hydraulic engineering - various equipment
- E) Biology, toxicology, bacteriological examination

- F) Analysis - measurement-control
- G) Sludges and effluents: disposal and utilization
- H) Policies of management-economics-legislation
- I) Energy
- J) Information
- K) Miscellaneous

For more information, contact: Association Francaise pour l'Etude des Eaux, Centre National de Documentation et d'Information sur l'Eau, 21 et 23 rue de Madrid, 75008 Paris, FRANCE.

INTERNATIONAL SYMPOSIUM ON AQUATIC MACROPHYTES

September 18-23, 1983, Nijmegen, The Netherlands.

According to Prof. Dr. C. den Hartog in the first circular, "the aim of the symposium is to exchange ideas and knowledge in this field of science, and to stimulate the personal contacts between the ecologists working on aquatic plants." The symposium will include the following subjects:

- 1) Structure, dynamics and functioning of whole aquatic macrophyte systems, as

STATUS OF IPPC - UNIVERSITY OF FLORIDA AQUATIC WEED PROGRAM

Nearly a year ago during budget cutbacks in the U.S. government, the U.S. Agency for International Development indicated that it could no longer be the sole supporter of the IPPC aquatic plant information and retrieval system. A review of our records indicates that approximately 40% of our users are from foreign nations and 30% each from Florida and the other 49 states, respectively. The cost of operating the system is about \$75,000/year. We have not charged users for services provided because of the problems and costs of accounting, invoicing, etc. We also believe that our primary target groups would not benefit from the program if charges were required.

Consequently, we have asked the State of Florida to provide the program with \$20,000 and other Federal agencies (U.S.A.I.D. and U.S.E.P.A.) to fund the program proportional to foreign and domestic (non-Florida) users. The Florida Department of Natural Resources has budgeted the program \$20,000 and it waits final budget approval by the Florida Legislature. We hope that in the next AQUAPHYTE, we can announce that the remainder of funds have been secured to continue this information service.

Use of the service continues to grow. Over 600 people now receive updates. There are over 3,000 people on the mailing list and over 15,000 articles in the database. The diverse nature of aquatic plant literature (which includes entomology, plant physiology, ecology, etc.) makes this service valuable to aquatic plant scientists throughout the world. We have often wondered how much money this service has saved and how much scientific research duplication it has helped prevent.

well as of the dominant system components

2) Life cycles of macrophytes with emphasis on survival strategy

3) Productivity and decomposition of macrophytes and their role in aquatic systems

4) Relationships between macrophytes and other organisms (grazing, periphyton, etc.)

5) Influence of human activities on macrophyte communities, eg. management of aquatic plants, effects of acid rain, etc.

The registration fee will be Dfl. 425,00. For information, write: Mrs. Dr. J.F.M. Geelen, Faculty of Science, Department of Aquatic Ecology, Toernooiveld, 6525 ED Nijmegen, THE NETHERLANDS.

INTERNATIONAL SEMINAR ON WASTEWATER TREATMENT USING AQUATIC PLANTS First Announcement and Request for Cosponsorship

The first international seminar on the utilization of aquatic plants for wastewater treatment is being planned by the Water Quality and Environment Division of the Centre for Water Resources Development and Management in Kerala, India.

Dr. S.A. Abbasi issued the first announcement for the seminar which is provisionally scheduled for April 14-16, 1984.

The following is from the first announcement: "The techniques of wastewater treatment using aquatic weeds and other aquatic plants is emerging as a powerful tool for environmentally safe treatment of municipal, agricultural and industrial effluents. The technique involves low establishment and operation costs, produces energy as a byproduct, and is notably free from generating secondary pollution problems. It is specially relevant in the context of tropical countries due to the availability of a large number of

existing wastewater lagoons, the treatment capacity of which can be improved considerably with very little extra cost by utilizing aquatic plants and the abundant sunshine. The proposed seminar would be amongst the very first ones on the subject and would bring together experts from all over the world to discuss the achievements, potentialities and problems associated with this technology. Emphasis will be given to formulate concrete action-plans for future R&D thrust in this area based on collaborative projects."

The organizers of the seminar also request cosponsorship money from universities, research centers, consultancy firms, industries and others. For more information, write: Dr. S.A. Abbasi, Head-in-charge, Water Quality and Environment Division, Centre for Water Resources Development and Management, Kunnamangalam P.O., Calicut, Kerala, INDIA.

AQUATIC WEED SHORT COURSE SCHEDULED

Dr. William Haller, Project Leader of the International Plant Protection Center's (IPPC) Aquatic Weed Program at the University of Florida has announced that there will be an International Training Course in the summer of 1984 in Gainesville, Florida. The course is sponsored by the U.S. Agency for International Development (AID), Oregon State University (IPPC) and the University of Florida's Center for Aquatic Weeds.

The Aquatic Plant Ecology and Management Short Course will be similar to the one held in Gainesville in 1977. The Course will include lectures on aquatic plant identification, ecology, growth, limnology, physiology, and various methods of control (biological, mechanical, chemical, etc.) Field trips and laboratory projects will include individual training in various ecological and control methodology. Lecturers will primarily be selected from the University of Florida faculty, with additional lectures from guest speakers from other institutions or agencies.

Tentative dates for the Course are June 18 through July 20, 1984 and will include attendance at the National Aquatic Plant Management Society Meetings to be held July 15-18 at Richmond, VA. There is no registration fee for the Course and individuals are expected to cover their individual costs of travel and subsistence. Registration will be limited to 15 people from less developed countries. For further information, please contact

Dr. W.T. Haller
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USA

FLORIDA WELCOMES POLISH GRASS CARP EXPERT

Noted fish scientist and aquaculture expert, Dr. Karol Opuszyński, from the Inland Fisheries Institute, Zabieniec, Poland, has begun a six month sabbatical at the Center for Aquatic Weeds, University of Florida, Gainesville. Dr. Opuszyński, author of over 70 scientific papers on reproduction and rearing of Cyprinid fish and a textbook on basic fish biology, was invited to Florida to cooperate with Dr. Jerome Shireman on various grass carp projects. Opuszyński conducted some of the original studies on grass carp. He has traveled extensively in the People's Republic of China, the Soviet Union and in Eastern Europe. Florida scientists have long been seeking feasible methods for sterilizing grass carp and raising young fry to stocking size large enough to escape predation by other fishes. Dr. Opuszyński will be working with the IPPC literature retrieval system also and requests other scientists to contribute any recent information on grass carp that may not yet be in the database.



OVERVIEW OF COMPUTER DATABASES

Computerized information systems dedicated to specific research areas are a relatively new phenomenon. However, with appropriate computers, large "database management programs" and, of course, a collection of information, computer databases can be created for any subject.

Simply described, a computer database is a library catalogue in a computer. Unlike conventional library systems, however, computer databases can combine, delete and otherwise cross-reference thousands of variables from citations and texts of books and articles in its memory, and print out lists of very specific citations. (Variables in the aquatic plant database include any words in citation titles or keyword indexes, categories, subcategories and species names as well as authors, sources, dates and so on.) This can be done in seconds, whereas manually searching for very specific information in conventional libraries usually takes weeks for the same results.

Besides "normal entries" which list titles, sources, authors, etc., computer systems can also include an unlimited number of descriptors of the texts of the citations. Computer systems can even store entire texts which can be "searched" for relevant terms, series of terms or phrases chosen by a user. (However, because of the expense, very few computer systems actually store entire texts.) The ability of computers to memorize, store, read, cross-reference and retrieve information from vast stores of words make them ideal for storing information about complex subjects.

Another major improvement of computerized systems over conventional library systems is the accessibility of computer databases to users in remote places. A suitcase sized terminal and printer held by a man in a ditch could tap into databases and find information as quickly as someone in a computer center and much more quickly than someone in a conventional library.

SETTING UP A SYSTEM

The most important consideration in developing a useful and fast computer database is not necessarily the computer itself. There are literally hundreds of computer hardware and software companies whose job it is to sell their goods, and so there are many seemingly conflicting points of view about the best database "configurations." There are some truisms for large databases, though, and they are listed here:

1) The computer itself (the "hardware") must have a memory large enough to hold the database "program" (the instructions to the computer telling it what to do with the information to be processed) as well as to process the information in the database. In the case of the U.F. aquatic plant database, the database "program" requires tens of thousands of bytes of memory. In addition, the 15,000 citations now in our database require more than 37 million bytes of memory. So the computer itself must be at least

able to temporarily handle "on-line", on magnetic discs or on magnetic tape, many millions of bytes ("megabytes") of information. ("Full text" memory of articles would require many, many additional megabytes of storage.)

In addition to having a large memory, the computer must be fast. There are many factors which determine a computer's speed, too many to list here. Suffice it to say that because a computer has a large memory does not mean that it can search its memory quickly. A "micro-computer" or "mini-computer" with a 50 megabyte storage system can take quite a while to search its files, especially if the search combines terms. Unless the retrieval capabilities are used only occasionally, a small computer is not going to be fast enough. The aquatic plant database uses the large "mainframe" computers of the Northeast (Florida) Regional Data Center for its computing.

2) If the computer is to be accessible by terminals at "remote" locations, the computer must also be "configured" with "modems" and other devices which enable it to communicate with terminals through telephone lines.

3) If the computer is to produce printed results of the work it has done, a printer is necessary. If the "output" is small, a small, slow printer might be adequate. If the output is large, as when current awareness updates are produced for many individuals, the output might easily reach a million lines. The aquatic plant database utilizes a 1,000/line/minute printer for its work, and even with this very fast printer, it takes nine hours of printing to produce our users' current awareness printouts.

4) The database management program is a very complex set of instructions which tells the computer how to do all of the storage and retrieval work previously described. Very few people know how to write such a complex program so it is likely that a commercial program will have to be purchased. The two most popular large database management programs on the commercial market today cost from \$50,000 to \$100,000.

5) "Input" to the database also must be considered. Often the input is the least considered aspect of database creation and management. While a computer systems consultant or engineer is trained to know how to configure a computer system, more often than not they have no idea what information, concepts, categories or key words are important to the subject of the database. Nor will they know what "strings" or "searching routines" (logical connections in computer searching commands) will be necessary for the retrieval of useful information from the database. These decisions must be made by the operators and users of the database.

6) Database creation also requires personnel to collect, read, and organize (by the assignment of categories, keywords, etc.) information relevant to the database. Input is almost invariably typed into the database by typists specifically trained to

do so. There are, however, machines on the market which can actually "read" any printed page and automatically enter required information directly into a computer database.

7) Creating and maintaining a computer database is an expensive thing to do. Personnel and computer costs are high, but the actual acquisition of research articles and books is even more expensive. A successful information and retrieval system requires the motivation and cooperation of those who expect to gain from its use. In the case of the U.F. aquatic plant database, the justification of its expense lies in the fact that its users also contribute information to it thereby making it comprehensive, useful and less expensive.

Setting up a useful computer database requires a motivated user group and lots of resources and time. With these ingredients present, no magic is necessary.

VI INTERNATIONAL SYMPOSIUM ON BIOLOGICAL CONTROL OF WEEDS

August 19-25, 1984, Vancouver, Canada. Sessions on the following topics with keynote speakers is being organized:

1) *Control of Aquatic Weeds* — Linda Edwards, Univ. British Columbia. "Chemical, biological or natural control of Eurasian milfoil: A study in biopolitics."

2) *Conflict of Interest in Weed Control* — Charles Turner, U.S.D.A., Albany, CA. "Non-target weeds and biological control." (Session to be organized by E. DelFosse, C.S.I.R.O., Canberra, ACT.)

3) *Thistlehead Insects* — Helmut Zwolfer, Universitat Bayreuth, West Germany. "Insects and thistleheads: Resource utilization and guild structure."

4) *Factors Affecting the Economic Feasibility of Biological Control of Weeds* — Kitty Reichelderfer, U.S.D.A., Maryland.

5) *Control of Weeds with Pathogens* — Speaker T.B.A.

6) *Indigenous Fauna and the Success of Introduced Insects* — John Lawton, University of York, England. "Ecological theory and choice of biological control agents."

7) *Genetic Variability and Biosystematics of Weeds* — Alina Stahevitch, Biosystematics, Agriculture Canada, Ottawa, Canada.

8) *Host Quality and the Effect of Stress on Components of Weed Biological Control* — Speaker T.B.A.

9) *Community Effects of Removing Dominant Plant Species* — Speaker T.B.A.

10) GENERAL SESSION.

Mid-meeting and post-meeting field trips to look at some biological control programs are planned. Conference proceedings, edited by Ernest Del Fosse, will be published. For more information, write: Dr. Judith H. Myers, I.A.R.E., 2075 Westbrook Mall, University British Columbia, Vancouver, British Columbia, Canada, V6T 1W5.

HYDRILLA BIOLOGICAL CONTROL AGENT

The larval stage of *Paropoynx*, an aquatic moth, is being investigated as a possible biological control of hydrilla. In recent trips to Panama, Dr. Dale Habeck and Christine Bennett observed "large areas of hydrilla which were devoid of leaves on the tip 6-8 inches due to the activity of the *Paropoynx* caterpillars." According to Habeck, several species of *Paropoynx* have been associated with hydrilla in Panama, and he had gone there to collect *P. rugosolis*. However, of the thousands of *Paropoynx* specimens collected, all of them were *P. diminutalis*, a species which already occurs in Florida.

HYDROBIOLOGICAL RESEARCH INSTITUTE

The Hydrobiological Research Institute and the Turkish-German Inland-Fisheries Project seek scientific exchange with other researchers and institutes involved in lake administration and fish farming. Associated with the University of Istanbul, the Institute conducts research in limnology and fish biology and management. Fish of particular interest are trout and carp, but lake stocking with pike and coregonids is also on their agenda. The Institute employs 35 staff members, including 14 scientists, and they offer research facilities and guest-houses to visiting scientists. For more information, contact: R. Rahe or M. Tokat, Hydrobiological Research Institute, Sapanca Balik Uretme ve Islah Istasyonu, P.K. 11, Kurtkoy-Sapanca, TURKEY.

WEED SOCIETY OF NEW SOUTH WALES

The Weed Society of New South Wales (Australia) was founded in 1966 "to promote a wider interest in weeds and their control." Other objects of the Society are:

- *to provide opportunities for those interested in weeds and their control to exchange information and ideas based on research and practice

- *to encourage the investigation of all aspects of weeds and weed control

- *to co-operate and, where appropriate, affiliate with other organizations engaged in related activities in Australia and overseas

- *to encourage the study of weed science and the dissemination of its findings.

- *to produce and publish such material as may be considered desirable

The Society is a member of the Council of the Australian Weed Science Societies.

According to Hon. Secretary W.J. Burke, the Weed Society of New South Wales has 130 individual members and 20 corporate members. Annual membership fees are \$12 for individuals and \$15 for corporate bodies. Their address is P.O. Box K287, Haymarket, New South Wales, 2000, AUSTRALIA.

BOOKS

AQUATIC VASCULAR PLANTS OF NEW ENGLAND. (In several parts) C.B. Hellquist; G.E. Crow. 1981. New Hampshire Agricultural Experiment Station, University of New Hampshire, Durham, New Hampshire, 03824, USA.

These reports treat species occurring in New England and include keys, comments on taxonomy and nomenclature, habitat and distributional information, water chemistry data, line drawings and dot maps. Part I. Zosteraceae, Potamogetonaceae, Zannichelliaceae, Najadaceae. Part II. Typhaceae and Sparganiaceae. Part III. Alismataceae.

Part IV. Juncaginaceae, Scheuchzeriaceae, Butomaceae, Hydrocharitaceae.

Part V. Araceae, Lemnaceae, Xyridaceae, Eriocaulaceae, Pontederiaceae.

AQUATIC WEED CONTROL IN LAKE WANAKA. Edited by H.R. Hughes and R.H.S. McColl. 1980. Information Series No. 143, New Zealand Department of Scientific and Industrial Research, P.O. Box 9741, Wellington, New Zealand. 49 pages.

Lake Wanaka was infested with *Lagarosiphon major*, "which doubled in area on average every 10-12 weeks although no evidence was found to show that this rapid growth resulted from cultural enrichment from Wanaka township." This volume reports on the effectiveness of repeated underwater spraying of diquat on *Lagarosiphon* stands

and the subsequent necessary hand-weeding of its new shoots.

WATER-HYACINTH (*EICHHORNIA CRASSIPES*), MOST TROUBLESOME WEED OF THE WORLD. B. Gopal; K.P. Sharma. 1981. Hindasia Publishers, Delhi, India. 128(91) pages.

This book "reviews fourteen hundred and fifty-seven published references covering all aspects of the plant — systematics, history of spread, morphology, anatomy, developmental biology, physiology, ecology, cytology, utilization and control (mechanical, chemical and biological). The book includes a large amount of unpublished data from the authors' own studies in India over the last fifteen years. It also presents a critical appraisal of the current situation concerning the control and utilization of the weed."

BIOLOGICAL CONTROL OF WEEDS — A WORLD CATALOGUE OF AGENTS AND THEIR TARGET WEEDS. Edited by M.H. Julien. 1981. Commonwealth Agricultural Bureaux, Slough SL2 3BN, United Kingdom. 108 pages.

"This is the most complete work of reference available on the biological control of weeds. The information is divided into three lists: List (A) deals with exotic invertebrate biological control organisms that have been released; List (B) with exotic vertebrate species used to control weeds; and List (C) with organisms used within their native ranges to control

Continued on page 8

MEETINGS

INTERNATIONAL SYMPOSIUM ON AQUATIC MACROPHYTES. September 18-23, 1983, Nijmegen, The Netherlands. (See announcement elsewhere in this issue of AQUAPHYTE.)

VI INTERNATIONAL SYMPOSIUM ON BIOLOGICAL CONTROL OF WEEDS, August 19-25, 1984, Vancouver, Canada. (See announcement elsewhere in this issue of AQUAPHYTE.)

10th INTERNATIONAL CONGRESS OF PLANT PROTECTION. November 20-25, 1983, Brighton, England. For registration form, 3rd circular and provisional programme, write: Congress Secretary, Mrs. R.A. Bishop, Frank Bishop (Conference Planners) Ltd., 144/150 London Road, Croydon CRO 2TD, ENGLAND.

9th ASIAN-PACIFIC WEED SCIENCE SOCIETY CONFERENCE. November 28-December 2, 1983, Manila, Philippines. For information, write: The Planning Committee, c/o Dr. Beatriz L. Mercado, BioScience Building, University of the Philippines at Los Banos, College, Laguna 3720, PHILIPPINES.

SYMPOSIUM ON WEED SCIENCE IN THE TROPICS. October 4-5, 1983, Selangor, Malaysia. For information, write: Sabudin Mohd. Ali, Secretary, Organizing Committee of Symposium on Weed Science, Department of Agronomy and Horticulture, Universiti Pertanian Malaysia, Serdang, Selangor, Malaysia.

METHODS OF WATER MANAGEMENT - 1984 AND BEYOND, FIFTH SUMMER SCHOOL, AUSTRALIAN WATER AND WASTEWATER ASSOCIATION. February 6-10, 1984, Canberra, Australia. For information, write: Peter Cullen, School of Applied Science, Canberra College of Advanced Education, P.O. Box 1, Belconnen A.C.T. 2616, Australia.

AQUATIC PLANT MANAGEMENT SOCIETY ANNUAL MEETING. July 10-13, 1983, Lake Buena Vista, Florida. Keynote speaker will be Dr. C.D.K. Cook. For information, write: Mr. Bill Rushing, P.O. Box 16, Vicksburg, Mississippi, 39180, USA.

FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY ANNUAL MEETING. The week of October 10-14, 1983 (exact dates to be decided soon). Plant City, Florida. For information, write: Mr. Jim McGehee, P.O. Box 212, MacLennay, Florida 32603, USA.

FIRST INTERNATIONAL SEMINAR ON WASTEWATER TREATMENT USING AQUATIC PLANTS. Proposed meeting dates, April 14-16, 1984, Kerala, India. (See announcement elsewhere in this issue of AQUAPHYTE.)

BOOKS

Continued from page 7

weeds. For each entry on the lists, the target weed and its origin are given, the agent and taxonomic references, the year the first release was carried out, the status and degree of control, the research unit involved, and general and taxonomic references."

AQUATIC AND WETLAND PLANTS OF FLORIDA. D.P. Tarver, J.A. Rodgers, M.J. Mahler, R.L. Lazor. 1979. 127 pages. Free, when requested in writing from: Florida Department of Natural Resources, Bureau of Aquatic Plant Research and Control, 3900 Commonwealth Blvd., Tallahassee, Florida, 32303, USA.

This color identification manual treats more than 100 species of aquatic plants found in Florida. Most plants are generally described, their habitats are described, and their distribution, importance and wildlife utilization value is briefly mentioned. Photographs depict the plants in their habitat, show their relative colors and sizes, and show each in "close-up". In addition, twenty species of algae are depicted and briefly described. A glossary is included.

L'EPURATION DES EAUX PAR LES PLANTES AQUATIQUES. (The Purification of Water by Aquatic Plants.) G. Blake, J.P. Dubois. 1982. Association Francaise pour l'Etude des Eaux, Centre National de Documentation et d'Information sur l'Eau, Paris. 103 pages. (In French)

This work is a "bibliographical synthesis" concerned with the process of water purification using macrophytes. Information on this subject has been compiled from more than 700 references. The work comprises two parts: the role and utilization of nutrient elements in aquatic vascular plants, and the role and utilization of heavy metals in them. In Part I, chemical composition, absorption sites and modes of transfer, and internal and external factors governing the growth of aquatic plants is discussed. In Part II, the uptake and evolution of boron, cadmium, copper, iron, manganese, molybdenum, lead and zinc is discussed. The authors conclude that several plants are particularly appropriate for the bioaccumulation of metals in water systems and make recommendations for their further study as water purifiers.

AN ILLUSTRATED GUIDE TO TIDAL MARSH PLANTS OF MISSISSIPPI AND ADJACENT STATES. L.N. Eleuterius. 1981. Gulf Coast Laboratory, Ocean Springs, Mississippi. 131 pp.

According to the author: "The most important feature of this field guide or handbook is that it entails only plant species known by the author to occur in the tidal marshes of Mississippi. This particular array of species has not been previously published in a single book or volume." This guide includes clear line drawings, species descriptions and habitat descriptions of 200 aquatic plants.

LITERATURE REVIEWS OF FOUR SELECTED HERBICIDES: 2,4-D, DICHLOBENIL, DIQUAT AND ENDOTHALL. Public health effects by Dr. Ruth Shearer. Effects on the aquatic environment by Mark Halter. 1980. Municipality of Metropolitan Seattle, Washington. 277 pages.

Public concern for the potential adverse effects resulting from the chemical control of *Myriophyllum spicatum* in Washington state prompted the creation of this report. Thirty-three questions such as "What are the potential risks to human health from aquatic use of these herbicides?" and "What are the chances that 2,4-D salts will harm the food webs upon which fish populations depend?" are posed and answers are drawn from the scientific literature.

MAJOR WEEDS OF RICE IN SOUTH AND SOUTHEAST ASIA. Keith Moody. 1981. International Rice Research Institute, P.O. Box 933, Manila, Philippines. 86 pages. \$5.50. (plus postage)

This pocket-sized book includes color-plates and descriptions of the 32 most widespread weeds of rice in the region, based on information available in the literature and a survey of weed scientists. The main purpose of the book is to help rice workers identify field weeds by visual comparison. A comprehensive glossary is included for those who are unfamiliar with the botanical language.

TARO — A REVIEW OF COLOCASIA ESCULENTA AND ITS POTENTIALS. Edited by Jaw-Kai Wang. To be published August 1983. University of Hawaii Press, 2840 Kolowalu Street, Honolulu, Hawaii, 96822, USA. 416 pages.

"This is the first and, so far, only book in English on taro. Nineteen leading experts have contributed to this broadly multidisciplinary work, which emphasizes the uses and potential uses of taro while bringing together and synthesizing all that is known about one of the world's most important root crops." Chapters on anatomy,

taxonomy and basic physiology and photochemistry are complemented by chapters on production technology and crop protection, providing a definitive reference for specialists in these areas. Also discussed is the production of alcohol fuel from taro, its potential as an animal feed, and the combined food and industrial uses for taro starches and gums. Much of the information on the use of taro silage as an animal feed has never before appeared in print.

INTEGRATED AQUATIC WEED MANAGEMENT — PRINCIPLES AND APPLICATIONS FOR RESERVOIRS IN THE SOUTHEASTERN UNITED STATES. R.W. Tyndall; P.N. Trudeau; D.V. Aurand; D.L. Smith. 1982. The MITRE Corporation, Metrek Division, 1820 Dolley Madison Boulevard, McLean, Virginia, 22102. 189 pages.

"The objective of this manual is to provide aquatic weed managers in the United States with suggestions for implementing a holistic systems approach to solving aquatic weed problems." Included in the manual are hypothetical management plans for reservoirs in the southeastern United States having unacceptable levels of *Myriophyllum spicatum* or *Hydrilla verticillata*. Potential environmental impacts, costs and monitoring criteria and procedures for implementing controls are described.

A REVISION OF THE GENUS ROTALA (Lythraceae). C.D.K. Cook. 1979. BOISSIERA Volume 29, Conservatoire et Jardin botaniques de la Ville de Geneve, Switzerland. 156 pages.

The genus *Rotala*, some species of which are "extremely successful weeds in rice fields and irrigation ditches," has not been revised since 1908. According to the author, A. Koehne recognized 41 species in 1908 and since then 40 new species have been described. The author accepted 44 of the "paper" species for this taxonomic revision. A key, synonymies, descriptions, distributions, notes, illustrations and maps are included.



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AQUATIC WEED PROGRAM

VOLUME 3 NUMBER 2

GAINESVILLE, FLORIDA

FALL 1983

APPLE-SNAILS EATING CHARA

By Dr. Nestor J. Cazzaniga, Universidad Nacional del Sur, 8000 Bahia Blanca, Argentina.

Chara is a widespread water weed that forms submerged prairies of high productivity. Its prairies are sometimes called "aquatic deserts". There are very few invertebrates that accept chara as food (Gajevskaja, 1958). Thus, its biological control should be attempted by means of vertebrates (fishes, manatee, etc.).

Chara vulgaris and other Characeae are the main trouble in the drainage system of the Lower Colorado River Valley (Buenos Aires Province, Argentina) where 140,000 hectares are under irrigation. Four hundred kilometers of main drainage channels convey excess water to the Atlantic in an attempt to reduce the progressive salinization that affects this semiarid region (Thorntwaite's classification: DB2db, after Cazzaniga, 1981).

The biotic association of the channels is relatively poor, with low species diversity. Frequent use of mechanical controls makes these associations very unstable. Most organisms must re-colonize the channels year after year.

Because mechanical control is so expensive and disruptive, the Commission for Scientific Investigations of the Buenos Aires Province (C.I.C.) in 1978 began support of a program to study alternate control methods. Preliminary results have been published in an internal report (C.I.C., 1981).

Some program experiments with chemicals were successful, but no natural biological controls were found in the channels. Therefore it was necessary to find a control agent in the aquatic fauna of other zoogeographic areas. No infrastructure was available for the introduction of white amur, and low winter temperatures prevented the use of tilapia or marisa.

A promising Argentinian organism was identified: the apple-snail, *Pomacea canaliculata*. They are usually called "ampularia" (from the generic name *Ampullaria* that is of customary use in South America for these species).

In 1960, Oliveira e Silva used ampularia, together with tilapia, for the control of *Anacharis densa* in Rio de Janeiro. Some references to other pomaceas have been made by Blackburn *et al.* (1971) and by Rushing (1975), but no detailed papers have been published on their actual potential as control agents.

Argentinian ampularias were fed on chara and other macrophytes present in the channels. They showed not only a great voracity but also a desirable polyphagy (Andres, 1968).

While most invertebrates are generally reluctant to feed on chara, each adult ampularia consumed 8 to 24 g. of chara daily in the laboratory. Ampularia also showed a preference for chara over sago pondweed and water milfoil.

Ampularia breeds in captivity and can be conveniently handled: they survived the travel from

Continued on page 4

COMPUTERIZED ADDRESS FILES TO BE AVAILABLE

The Aquatic Weed Program is developing files of addresses of researchers and research institutions from around the world. The files will be maintained on computer as part of the aquatic plant database. Users will use these files for making contacts with colleagues, requesting reprints and planning travel itineraries.

SEE PAGE SEVEN
FOR MORE INFORMATION.

WATERHYACINTH SOCIETY OF JAPAN

The Waterhyacinth Society of Japan (WSJ) was founded in July, 1982. The society has 120 members who are interested in waterhyacinth in Japan. President of the society is Dr. K. Ueki, professor of weed science at Kyoto University. Dr. Yoko Oki is editor of the society's newsletter which is written in Japanese. For information about the society and waterhyacinth problems in Japan, write to Dr. Oki at Institute for Agricultural and Biological Sciences, Okayama University, Kurashiki-710, JAPAN.

U.F. GRASS CARP RESEARCH

The collaboration between two of the world's leading fish biologists is yielding results applicable not only to the aquaculture of grass carp (*Ctenopharyngodon idella*), but also to the artificial culture of other fishes, including sport and food fish such as striped-bass. Aquaculture and bio-manipulation techniques they have devised are producing nearly 100% survivability among grass carp fry. Their techniques and apparatus have produced more fish fry in several small fish tanks than are produced in conventional 1-hectare aquaculture ponds, with attendant reduction in man-power and time spent. These methods could dramatically increase the yield of fish-farms which specialize in food or sport fish or fish used for control of aquatic weeds. In a world increasingly needful of protein for growing populations, and also increasingly harrassed by aquatic weeds, the beneficial implications of their research is obvious.

Dr. Jerome V. Shireman and Dr. Karol Opuszynski have been working together at the Center for Aquatic Weeds in Gainesville (Florida) for the past six months. They expect to continue their work for the next six months. Dr. Opuszynski is visiting researcher from the Inland Fisheries Institute, Zabieniec, Poland. As a recognized expert on grass carp, he was invited to contribute to the work of the Center's fish culture unit under a grant from the United States Department of Agriculture. Dr. Shireman has coordinated the Center's grass carp research for the past nine years.

Grass carp researchers of the Center, including Shireman, D.E. Colle, R.W. Rottman and F.J. Aldridge, have been studying ways to culture

Continued on page 5

AQUATIC PLANT INTERNATIONAL SHORT COURSE PLANNED

A five-week course, International Training Course on Aquatic Plant Ecology and Management, will be held at the University of Florida June 10 through July 13, 1984. This course is open to 15-18 participants from developing nations, and to date 23 people have expressed interest and have requested further information. The course will be very similar to one held in Gainesville during the summer of 1977.

The Training Course will be sponsored by the U.S. Agency for International Development, the International Plant Protection Center of Oregon State University and the University of Florida Center for Aquatic Weeds. There will be no registration fees for the course. Participants are expected to provide their own living and traveling expenses. Arrangments are being made for low-cost housing. Field trips in Gainesville will be provided at no charge to participants.

The tentative itinerary is as follows:

June 9-10—arrive in Gainesville, Florida

June 11-15—attend extension aquatic weeds training course (see announcement elsewhere in this issue)

June 18-22—research/demonstration projects, literature survey lectures

June 25-29—field trip

July 2-6—lectures, individual projects, term papers

July 9-13—final reports, lectures, demonstration project review

July 12-14—depart Gainesville

Transportation will be provided for training course participants to attend the National Aquatic Plant Management Society Meetings in Richmond, Virginia, July 15-18.

Daily schedules are now being finalized and a list of expenses is available. For further information, contact: Dr. W.T. Haller, Center for Aquatic Weeds, 7922 N.W. 71st Street, Gainesville, Florida 32606, USA.

IPPC SPONSORS TOUR

Several out-of-state and overseas scientists recently became acquainted personally with some of Florida's aquatic plant management projects. They took part in a tour arranged by Dr. William Haller of the University of Florida's Center for Aquatic Weeds and the International Plant Protection Center's Aquatic Weed Program. The tour took place following the Aquatic Plant Management Society's annual meeting near Orlando.

The group visited several sites, including the City of Lakeland's treatment plant which utilizes aquatic plants for nutrient removal, the Lake Okeechobee hydrilla and waterhyacinth control programs, and the Florida Power and Light Company's Martin County Cooling Reservoir torpedo grass research project. They also visited the Congen Properties grass carp project where the fish controls hydrilla in agricultural canals, and saw harvesting equipment controlling hydrilla and hygrophila in Lehigh Acres. The tour ended with visits to the Corkscrew Swamp Sanctuary and the Fairchild Tropical Botanical Gardens in Miami.

Members of the enthusiastic group shared their own expertise with managers of these projects and the personal relationships developed undoubtedly will continue to be of benefit to all concerned.



AUSTRALIAN weeds

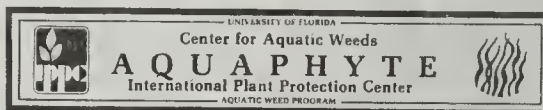
AUSTRALIAN WEEDS is a new publication and is the official journal of the Council of Australian Weed Science Societies. It is the only journal which deals with weeds of their part of the world.

Edited by Dr. J.T. Swarbrick, the journal presents original research, book reviews, article

abstracts, weed control equipment reviews, general articles, and conference reports. It also announces upcoming conferences, has a letters column and invites editorials from weed scientists.

Another feature of this journal is the fullpage color painting of a weed by artist Betty Conabere in each issue accompanied by texts from W.T. Parsons' *Noxious Weeds of Victoria*.

Overseas subscription cost of AUSTRALIAN WEEDS is \$25 (Aust.) for individuals and \$30 (Aust.) for libraries. For subscription information, contact Inkata Press Pty Ltd, 4 Longbourne Avenue, North Clayton, Victoria 3168, AUSTRALIA.



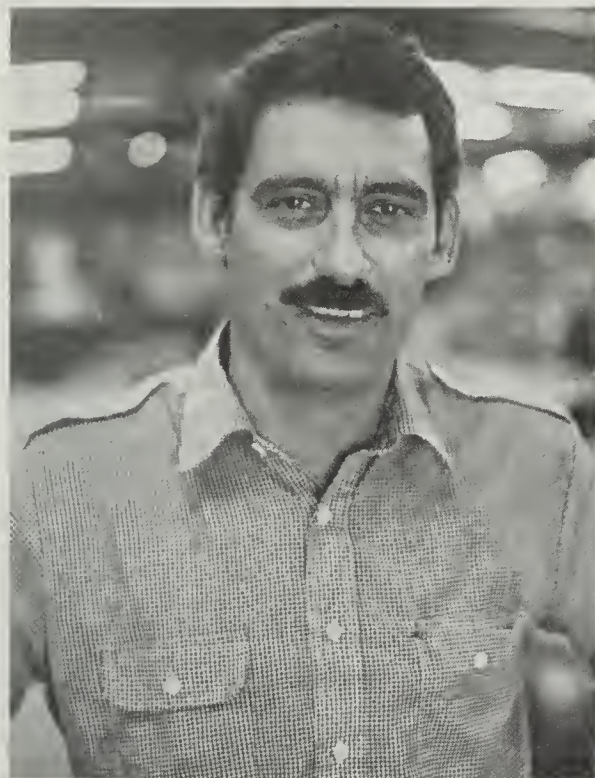
AQUAPHYTE is the newsletter of the Center for Aquatic Weeds and the IPPC Aquatic Weed Program of the University of Florida. The Center for Aquatic Weeds is in the Institute of Food and Agricultural Sciences (IFAS). The International Plant Protection Center (IPPC) is a unit of Oregon State University and is funded by the United States Agency for International Development. Program support is also provided by the Florida Department of Natural Resources.

EDITOR: Victor Ramey

AQUAPHYTE's circulation is 3,500. It is distributed to aquatic biologists and agencies world-wide. Comments, announcements, news items and other information relevant to aquatic plant research are solicited.

We gladly permit free republication of AQUAPHYTE items when accompanied by full acknowledgement. Views and interpretations in this publication are not attributable to the U.S. Agency for International Development nor any individual acting in its behalf, nor to the International Plant Protection Center, nor to the Florida Department of Natural Resources. Inclusion in AQUAPHYTE does not constitute endorsement, nor should exclusion be interpreted as criticism of any item, firm or institution by the University of Florida, AID, IPPC or DNR.

U.F. CENTER FOR AQUATIC WEEDS HAS NEW DIRECTOR



Dr. Joseph C. Joyce
Director
Center for Aquatic Weeds
Institute of Food and Agricultural Sciences
University of Florida
7922 N.W. 71st Street
Gainesville, Florida 32606 USA

The Center for Aquatic Weeds welcomes its new Director, Dr. Joe Joyce. Simultaneous with Dr. Joyce's appointment, the Center was reorganized and now reports directly to the U.F. Vice-President for Agricultural Affairs, Dr. K.R. Tefertiller. This reorganization will enable Dr. Joyce, as Director, to coordinate effectively the activities of researchers of various disciplines who are associated with the Center. He hopes to expand the Center's level of basic aquatic plant research as well as research on aquatic plant management techniques which are compatible with the aquatic environment. Through coordination with state and federal agencies involved with aquatic plant research and control, Dr. Joyce expects the Center to become a nationally and internationally recognized aquatic plant research facility.

Before he came to the University of Florida, Dr. Joyce was Chief of the Natural Resources Management Section of the Jacksonville (Florida) District of the U.S. Army Corps of Engineers. In this capacity, he was responsible for federal aquatic plant control programs in Florida, and on a national basis assisted other federal and state agencies in all aspects of aquatic plant control programs. He had been with the Army Corps for twelve years.

Dr. Joyce says he is most honored to have been selected for this position and particularly appreciates the assistance and support given during his transition by the Center's previous directors, Drs. Arnett Mace, Jr. and William T. Haller.

FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY MEETS FOR SEVENTH TIME

There are tens of thousands of miles of rivers and canals in Florida and more than 7,700 lakes. Because of Florida's sub-tropical climate and high nutrient input from residents, tourists and industries, many of these waters are subject to massive aquatic plant overgrowths. In Florida, several state and federal departments and many country and other local agencies maintain aquatic plant management branches staffed by hundreds of managers, applicators and other field personnel and scientists.

Coordinating the efforts of these aquatic plant management specialists requires means of communication and feed-back. In Florida, a major means of communication is the Florida Aquatic Plant Management Society. FAPMS sponsors annual meetings and publishes *AQUATICS* magazine and the society newsletter for its more than 600 members. In Plant City recently (October 12-14), nearly 300 FAPMS members convened for their seventh annual meeting.

During three days, members heard papers given on a variety of subjects, including reports about recent advances in chemical, biological and mechanical control methods, and reports from government agencies about their programs.

In keeping with the program theme (Public Awareness, Communication and Education), Mr. Ronald Arnold delivered the keynote address, "Government by the Media." As a practicing journalist, Mr. Arnold introduced his audience to the professional goals of journalists and described how their goals can affect the tone and accuracy of newspaper and other mass-audience reports. Mr. Arnold said aquatic plant management personnel (and others questioned

by reporters) must take into account the goals of journalists and also must be able to answer questions clearly, concisely and honestly. The panel discussion which followed featured the views of a journalist for the Orlando Sentinel and several agribusiness professionals; an interesting "give-and-take".

Later, a chemical and mechanical control equipment demonstration enabled members to compare their own control methods and machinery with those of others in the Florida aquatic plant management industry.

EXTENSION SHORT COURSE ON AQUATIC WEEDS

Dr. Vernon Vandiver (University of Florida) and Mr. William Maier (Florida Department of Natural Resources and the Center for Aquatic Weeds) have announced the organization of a four-day extension aquatic weed short course to be held in Gainesville June 11 (noon) through June 15 (noon), 1984. This course is similar to the one held in 1982 and is primarily designed for extension agents, water management personnel, city, county and other agencies and people responsible for aquatic weed control programs. The course will cover state-of-the-art chemical, biological and mechanical means of plant management, biology-ecology of aquatic systems, plant identification and other subjects pertinent to aquatic plant management in Florida. For further information, contact Dr. Vernon Vandiver, Agricultural Research Center, 3205 S.W. College Avenue, Ft. Lauderdale, Florida, 33314.

BOOKS AND REPORTS

AZOLLA AS A GREEN MANURE: USE AND MANAGEMENT IN CROP PRODUCTION. T.A. Lumpkin and D.L. Plucknett. 1982. Westview Tropical Agriculture Series, No. 5, Westview Press, Boulder, Colorado. 230 pages.

This is a detailed and comprehensive review of *Azolla* and its utilization as a biofertilizer in flooded rice cultivation. "In this first book on *Azolla* to be published in the Western World, the authors draw on Chinese, Vietnamese and Western literature to provide a scientific and management framework for the use of *Azolla* in agriculture, especially in the developing world."

This aquatic fern, which harbors nitrogen-fixing blue-green algae (*Anabaena*), has been cultivated and used as green manure since at least the 11th century. Included in this work are chapters on the history of its use, its taxonomy and ecology, its physiology, its nursery culture and field cultivation, and its pests and pest control. A chapter on the use of *Azolla* in farming systems includes translations of Chinese and Vietnamese cultivation guides as well as information on *Azolla*'s effects on soils and crop yields. A chapter on other uses for *Azolla* includes reviews on its use as feeds for livestock, swine, poultry and fish. Finally, the book includes an extensive bibliography, including several hundred Chinese publications on *Azolla*.

WATER POLLUTION AND MANAGEMENT REVIEWS. Two volumes. C.K. Varshney, editor. 1981, 154 pages. 1982. South Asian Publishers Pvt. Ltd., 36 Netaji Subhash Marg, Daryaganj, New Delhi 110002, INDIA. 172 pages.

According to the press release, these reviews are "intended to overcome the communication gap by providing exhaustive reviews on specialized topics" related to water management. Each volume contains nine contributed reviews as well as author and subject indexes.

WATERPLANTS OF NEW SOUTH WALES. G.R. Sainty and S.W.L. Jacobs. 1981. Water Resources Commission, New South Wales, Australia. 550 pages.

This is a lavishly produced hard-bound book which includes three identification keys to the water plants including algae, bryophytes, pteridophytes, angiosperms, monocotyledons and dicotyledons. Many of the color photographs are full page size. Description, growth biology, habitat, economic significance and distribution of each species is given. Following the identification section are photographic sections on waterplants in rice fields, seeds of waterplants and freshwater algae. Following these is a section on the pests common carp, goldfish, crayfish and water rat. Next is a section by K.L.S. Harley in which he reviews Australian biological control work on water hyacinth, alligatorweed and salvinia and a section on nutrient enrichment eutrophication by K.H. Bowmer. A final section on management techniques used in New South Wales emphasizes control methods used in irrigation systems. A glossary and index completes the book.

FIELD PROBLEMS OF TROPICAL RICE. Revised Edition. International Rice Research Institute. 1983. IRRI, P.O. Box 933, Manila, PHILIPPINES. 172 pp.

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SALVINIA BIOGAS IN INDIAN KITCHENS

African payal, Kariba weed, kayambang, chawk hunu, nae daeng, beo tai chuok, lukut cay, mata lele...salvinia. Whatever its local name, the free-floating fern *Salvinia* has become a menace in Africa, Asia, Australia, Central America and India. It can sometimes choke a lake about as fast as you can say its name. Sometimes, though, researchers devise a "use for the useless". In the case of salvinia, for example, it is now known that biogas for domestic consumption can be generated using standard biogas generation units fed with salvinia. In India,

researchers have been producing biogas from salvinia for the past two years.

As a result of this research, biogas production from salvinia is already finding its place in some Indian homes, according to S.A. Abbasi and P.C. Nipanay of the Centre for Water Resources Development and Management. Using available digester technology, it has been found that salvinia produces biogas either by itself or as a supplement with dung. They also report that obnoxious odors sometimes produced by biogas generation are not produced using salvinia.

According to CWRDM researchers, farmers and housewives who have used the salvinia biogas units are pleased with the results.

The Centre is also developing methods for the harvesting, storing and feeding of salvinia into generators which can be adopted easily by farmers and others in need of biogas.

For more information on salvinia biogas production in India, contact Dr. Abbasi at: Water Quality and Environment Division, Centre for Water Resources Development and Management, Kozhikode-673 571, Kerala, INDIA.



Mr. Nipanay (center) feeding salvinia to the digester as Dr. Abbasi (left) looks on. Mr. Rairukutty (right), on whose farm the digester unit is located, is obviously delighted with the project.



A housewife using salvinia-derived biogas for cooking.

HALLER RETURNS HOME

IPPC Aquatic Weed Program leader William Haller recently returned from a trip to The Netherlands, Sri Lanka and Thailand. Haller reports that the International Symposium on Aquatic Macrophytes, 18-23 September, organized by the Faculty of Science, Department of Aquatic Ecology, Katholieke University, Nijmegen, was well organized and attended, a truly educational experience. More than eighty scientists representing nearly twenty countries exchanged information and research results in informal discussions as well as during scientific presentations.

In Sri Lanka, Haller visited with the staff of the USAID mission and reviewed research with Sri Lankan scientists in several ministries and educational institutions. Similar exchanges and discussions were held in Thailand.

MIMOSA PROCEEDINGS AVAILABLE

The possibility of holding another *Mimosa pigra* conference in the next two to three years was discussed with Dr. Banpot Napompeth of Thailand. Haller, Napompeth and Ian Miller of Darwin, Australia were selected at the close of the last *Mimosa* conference to be the organizing committee for a future *Mimosa* meeting. If research advances continue at the present pace, it is likely that another symposium will be held in 1986 or '87, most likely in Australia. Meantime,

the Proceedings of the First International Symposium on *Mimosa pigra* Management (22-26 February 1982) have been published and free single copies are available for those in developing countries. For copies, contact: I.P.P.C., Oregon State University, Corvallis, Oregon 97331, USA.

SNAILS

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Rio de la Plata to the Colorado River (800 km) in wooden boxes, without water, on a truck.

Trials made in confined areas of channels gave the following information:

- Ampularia effectively controlled chara in small scale trials.
- They actively bred after transport to the new environment, notwithstanding the high salinity (about 12 g/l).
- They tolerated the winter temperatures, the minimum of the coldest month (August) being 1.1 degrees C. and -5.7 degrees C. (average and absolute respectively).

Now, four years after the first experiment, a successful population of ampularia is maintained in a portion of a drainage channel. Future research will concentrate on their resistance to herbicides, their action on rice and other aquatic crops, their life histories and other important aspects of their biology.

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GRASS CARP

Continued from page 1

grass carp and grass carp hybrids. They have raised male and female grass carp to maturity in ponds and in circular flowing tanks about 4-feet in diameter. They have studied the viability of the sperm and eggs produced by grass carp raised under these conditions, have created artificial conditions of time, temperature and current velocity to induce out-of-phase spawning in the fish, and have produced many spawns.

These researchers have also devised ways to fertilize the large numbers of eggs spawned and have created the natural conditions necessary to cause the eggs to develop and hatch. However, as in research reported elsewhere, the newly hatched fry did not enjoy a high survival rate. Those that did survive faced the problem of having the correct foods to eat. It has been known that newly hatched very small grass carp fry feed on zooplankton (rotifers) of a certain species and size. The problem then was how to culture the density of these microscopic animals necessary to assure the fry enough to eat. A few days after hatching, the fry would require other larger zooplankton to eat. The next problem, therefore, was how to create a biological succession of larger zooplankton for the older fry.

Enter Opuszynski. He and Shireman set out to create a constant supply of rotifers in the water for the fry to feed on, and to devise culture methods which would assure maximum survivability of the fry. This meant that a minimum of 1,000 rotifers per cubic liter had to be maintained to promote the growth of the fish larvae until they could consume artificial diets. Assuring maximum survivability also meant raising the fry in an enclosed space protected from insects and other predators and eliminating the need to handle the fry. Their goal was to improve on the usual survival rate of 30-50% which is common in conventional rearing situations.

They first treated the pond water which was circulating through larvae tanks and cages with a selective poison (Dylox) to eliminate crustaceans. Then the water was fertilized with chicken or pig manure to promote the growth of the rotifers. The fish larvae were confined in mesh cages inside the pond, the mesh of which allowed only rotifers of the correct size to enter and be available to the larvae. Additional larvae were grown in circular tanks. As larvae grew and required larger rotifers, they were transferred to cages of larger mesh size. The cages used had been used by Opuszynski for raising grass carp in Poland. The larvae required a constant water flow for survival. In Poland, Opuszynski's cages were able to use a "gravity-flow" technique to maintain a constant flow. In Florida, the cages had to be fitted with an "air lift" to stimulate the flow of water.

Their results have been impressive. Using these techniques, Shireman and Opuszynski were able to promote rotifer growth to several thousand per liter, which is much higher than the 1,000 per liter necessary for larval growth. The survival rate of the larval fry under these conditions was almost 100% compared to the usual highest survival rate of 50% in European ponds. This intensive rearing technique nearly eliminates fry loss due to insect predation and handling.

Opuszynski reports they were able to raise 10,000 fry in a 0.5 cu. meter system, whereas a 1-hectare pond usually can produce 100,000 fry. Thus, ten tanks in a small area could support the same number of fry as are raised in a 2-acre pond. Because of higher survivability, fewer



Dr. Karol Opuszynski and Dr. Jerome Shireman

brood fish would be required. The implications of using these techniques in commercial fish operations are obviously significant. Shireman suggests a rearing complex in which four support ponds would feed rearing tanks with small rotifers from one pond, larger rotifers from another and crustaceans from the other two. In this way, he believes a half-acre area could support up to 1/2 million fry.

In the next phase of their collaboration, Shireman and Opuszynski intend to 1) determine at what age fry can accept artificial diets, 2) compare the growth promotion of the four best commercially available artificial diets and determine the best diet for certain conditions, 3) determine the optimum temperature for the growth of fry using several temperature regimes, 4) combine artificial spawning methods to alter the spawning season to fit the best time for larval rearing (thus making the growing season much longer, and producing several spawns per year) and 5) developing a sterile grass carp by genetic manipulation and producing large numbers of them using their intensive rearing techniques.

While in the United States, Opuszynski has already given lectures in Orlando, at the A.P.M.S. annual meeting, to government officials in Tallahassee, and at the National Fisheries Research Center in West Virginia. He has also exchanged information with researchers in Arkansas and Missouri and of course, has given seminars in the Institute of Food and Agricultural Sciences at the University of Florida.

We are happy to report in **AQUAPHYTE** the progress of these two scientists and expect to report on more of their work in the future.

SCAPMS

The South Carolina Aquatic Plant Management Society, Inc. publishes the SCAPMS Newsletter which includes information on aquatic plant issues in South Carolina. The address of SCAPMS is 223 North Live Oak Drive, Noncks Corner, South Carolina 29461 USA.

CARIBBEAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE

The Caribbean Agricultural Research and Development Institute (CARDI) is a regional organization which was established in 1975 to serve the agricultural research and development needs of the twelve member countries of the English-speaking Caribbean community. CARDI members include Belize, Jamaica, Antigua, Montserrat, Barbados, St. Kitts-Nevis, St. Lucia, St. Vincent, Dominica, Grenada, Guyana, and Trinidad and Tobago.

One of CARDI's goals is to increase local small farmer food production. Also among its goals is increased productivity of commodities such as peanut, bean, cowpea and corn. Work on forage legumes, alternative protein sources, and energy sources is also under way in an effort to improve animal production systems. CARDI also conducts or coordinates training workshops, seminars and short courses which introduce new methodologies to farmers of the member countries.

CARDI publishes Factsheets and Reports on a variety of subjects. Factsheets have been published on rabbit diseases, hot water treatment of seeds, eggplant production, monkey control and other subjects. Reports on propagation of yams, peanut production, banana based cropping systems and other subjects have also been published.

CARDI COURIER is the quarterly newsletter of CARDI. It features articles on agricultural subjects of interest to the farmers of the Caribbean. Information on CARDI and subscriptions to COURIER are available from CARDI Agricultural Information Services, P.O. Box 51B, Britton's Hill, St. Michael, Barbados, W.I.

BOOKS AND REPORTS

Continued from page 3

This colorful handbook pictures and describes more than 30 species of insects and 24 bacterial, fungal and nematodal diseases which attack rice fields. In addition, 16 species of paddy weeds are presented and 13 soil deficiency and toxicity problems common to rice fields are described. Rice plants under stress by each of these pests are pictured making this a useful field guide for identifying field problems of tropical rice.

PROCEEDINGS. INTERNATIONAL SYMPOSIUM ON AQUATIC MACROPHYTES, 18-23 September 1983, Nijmegen, The Netherlands. Faculty of Science, Department of Aquatic Ecology, Catholic University, Nijmegen, The Netherlands. 1983. 326 pages.

This book compiles all fifty-three papers presented at the recent Symposium. Included are reports on freshwater and marine plants. For a copy: Within Europe—send Dfl. 65,-; Outside Europe—send Dfl. 85,-. By check to: F.B.W. 3063, Faculty of Science, Nijmegen, The Netherlands. Please mention: "Proceedings Macrophytes".

WILD RICE PRODUCTION IN MINNESOTA. Extension Bulletin 464-1982. University of Minnesota, Agricultural Extension Service, St. Paul, Minnesota 55108. 38 pages.

This is a collection of articles by E.A. Oelke and seven of his colleagues. It is a handbook for the cultivation and commercial production of wild rice (*Zizania spp.*). It includes chapters on site selection and preparation, varieties, establishment, soil fertility, water and weed management, insects and diseases, harvesting, tilling, processing, marketing and food value and uses of wild rice.

PROCEEDINGS. AQUATIC WEEDS SEMINAR held at Massey University, May 1983. Agricultural and Horticultural Sciences Extension, Department of Agronomy, Massey University, Palmerston North, New Zealand. 106 pages.

This publication is a collection of the resumes of papers presented at the seminar held May 20-23, 1983 which was convened by Dr. Giles Ivens. Weed problems in New Zealand lakes, waterways and drains are discussed; survey and management techniques are described and herbicides, their action and their application methods are described. Other papers deal with biological control, mechanical control, weed control economics and legal aspects of weed management.

EFFICACY OF HYDRILLA CONTROL AND A STOCKING MODEL FOR HYBRID GRASS CARP IN FRESHWATER LAKES. J.A. Osborne. 1982. Office of Exploratory Research (RD-675), U.S. Environmental Protection Agency, Washington, D.C. 143 pages.

This report reviews the development of the hybrid grass carp and describes the results of stocking hybrid grass carp in several central Florida lakes for the control of *Hydrilla verticillata*. The author concluded that "the ability of the hybrid grass carp (1979, 1980 and 1981 spawns) as a weed control agent is severely limited due to high mortality from hybridization and predation and its very low feeding rate associated with its low growth rate. I conclude that the hybrid grass carp should not be used in

weed management schemes in an attempt to control hydrilla or other submersed aquatic plants in Florida or elsewhere as the fish are ineffective."

TREATMENT OF SEWAGE EFFLUENT USING THE WATER FERN SALVINIA. C.M. Finlayson, T.P. Farrell and D.J. Griffiths. 1982. Water Research Foundation of Australia, Report No. 57. 37 pages.

This report describes the effectiveness of *Salvinia molesta* in a tertiary treatment process in the Mount Isa City sewage treatment plant. This is one of only a very few reported projects in which salvinia is used for water treatment.

BIOLOGICAL CONTROL OF WEEDS WITH PLANT PATHOGENS. Edited by R. Charudattan and H. L. Walker. 1982. John Wiley and Sons, New York. 293 pages.

This book is a consolidation of information presented during the workshop, "Biological control of weeds with fungal plant pathogens". The workshop was held in Little Rock, Arkansas and was sponsored by the University of Arkansas and the U.S. Department of Agriculture and was held September 8-10, 1980. According to the editors, this book is the first multidisciplinary treatment of this subject area.

The book includes sections on conventional weed control technology and the current status of plant pathogen controls, disease development and impact on host plant populations, genetic variation in weeds and in their pathogens, mass production of pathogens and their management, and integrating microbial herbicides with existing pest management programs. Appendix 1 is a collection of abstracts of research projects. Other appendices list scientific and common names of plants, their pathogens and pesticides. An author and subject index concludes the book.

UTILIZATION AND CONTROL OF WATER HYACINTH IN SUDAN. O. Philipp, W. Koch, and H. Koser. 1983. Report No. 22, German Agency for Technical Cooperation (GTZ), Dag-Hammarskjold-Weg 1, P.O. Box 5180, D-6236 Eschborn/Ts. 1, Federal Republic of Germany. 224 pages.

This book details the water hyacinth cooperative work of the GTZ and the Democratic Republic of Sudan during the past several years. They found that eradication of the weed "proved impossible and even reasonable control is difficult." They therefore devised a "systems approach" integrating chemical control and utilization of the plant.

Sections of the book cover reproduction and growth, chemical control, chemical composition, harvesting, agricultural utilization and biogas production. The economics of control methods and utilization is a major theme throughout these studies.

In greenhouse and field experiments, the efficacies and biological effects of several aquatic herbicides were compared. In addition, 2, 4-d reliability was tested at different temperature, humidity and spray volume levels.

Water hyacinth was tested as a bio-fertilizer on several crops. It was also tested as a silage and hay in feeding trials using a variety of animals.

Water hyacinth also was tested for biogas production in batch digesters. Several digester designs were used and compared. The plant's potential as a wood substitute for burning also was examined.

SUSSWASSERFLORA VON MITTEL-EUROPA. By S.J. Casper and H.-D. Krausch. 1. Teil: Lycopodiaceae bis Orchidaceae, 1980, 403 pages. (In German) 2. Teil: Saururaceae bis Asteraceae, 1981, 540 pages. (In German) Gustav Fischer Verlag, Stuttgart, New York.

These volumes comprise an identification manual or the waterplants of central Europe. Book one also has chapters on systematics and taxonomy, ecology, sociology and chorology. Book two includes an index and a 53-page literature list. Both books include keys and are illustrated with line drawings of all parts of the plants.

NUISANCE AQUATIC PLANTS AND AQUATIC PLANT MANAGEMENT PROGRAMS IN THE UNITED STATES. Volume I, Southwestern Region, by R.W. Tyndall, Aug. 1982, 142 pages. Volume II, Southeastern Region, by D. Aurand, Nov. 1982, 359 pages. Volume III, Northeastern and North Central Regions, by P.N. Trudeau, Oct. 1982, 157 pages. Volume IV, Northwestern Region by D. Aurand, March 1983, 157 pages. The MITRE CORPORATION, Metrek Division, 1820 Dolley Madison Boulevard, McLean, Virginia 22102, USA.

These volumes identify and review nuisance aquatic plants and the problems they cause in each of the regions of the continental United States. Local, state and federal management programs are described. Recommendations for future work are suggested.

LAKE TAUPO—ECOLOGY OF A NEW ZEALAND LAKE. Coordinated by D.J. Forsyth and C. Howard-Williams. 1983. Science Information Publishing Centre, New Zealand Department of Scientific and Industrial Research, Wellington. Information Series No. 158. 163 pages.

This book is a collection of reports about Lake Taupo, a natural recreational lake surrounded by the mountains of New Zealand. It is one of the world's great trout fisheries and has "emerged as a holiday and recreational area of great natural and national significance." This is a historical and natural description which "should prove of incalculable value to the many conservationists who have fallen under the spell of Lake Taupo and who are determined that the spell shall endure." Among the sections about climate, hydrology, development and management, birds, fish and animals is one about the plants of the littoral zone by C. Howard-Williams and W.F. Vincent.

STUDY OF A NATURALLY OCCURRING HYDRILLA INHIBITOR. D.F. Martin. 1983. Miscellaneous Paper A-83-2, prepared by University of South Florida, Tampa, Florida, for the U.S. Army Engineer Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi, USA. 36 pages.

This is a report of an ongoing study to discover and evaluate naturally occurring chemicals that inhibit the growth of *Hydrilla verticillata* and provide information that will assist in the evaluation of these materials as aquatic plant herbicides. It had been observed that hydrilla present in a Florida lake had not spread during a 10-year period. To find out if a natural inhibitor was present, lake sediment was chemically analyzed and fractionated. The sediment yielded a fraction which subsequently has been shown to inhibit the growth of hydrilla by 30 percent, as

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DIQUAT

Diquat is an aquatic herbicide used in many areas of the world. The following is a list of selected diquat citations retrieved from the Aquatic Weed Program's aquatic plant database:

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FIELD EVALUATION OF TWO ENDOTHALL FORMULATIONS FOR MANAGING HYDRILLA IN GATUN LAKE, PANAMA. H.E. Westerdahl. 1983. Technical Report A-83-2, U.S. Army Engineer Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi. 171 pp.

The cooperative field study was to evaluate the efficacy of two endothall formulations, determine their effects on water quality and non-target plankton, evaluate the extent of their dispersion in the test area and determine the persistence of their residues in water, hydrilla and sediment. Both formulations (Aquathol K and Hydout) were effective in controlling hydrilla, although Hydout required much more time for hydrilla knockdown. No adverse effects on water quality were observed. Planktonic communities were only briefly affected. Persistence of endothall in the water of test plots of both formulations was less than 7 days. Endothall persistence in the plant tissue was 7 days in the Aquathol K plots, and more than 21 days in the Hydout plots.

AERIAL SURVEY TECHNIQUES TO MAP AND MONITOR AQUATIC PLANT POPULATIONS—FOUR CASE STUDIES.

E.A. Dardeau, Jr. 1983. Technical Report A-83-1, U.S. Army Engineer Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi. 49 pp.

This report contains four case studies of aerial surveys to map and monitor the areal extent of submerged and emergent aquatic macrophyte populations. Unique photointerpretation and mapping procedures and computer software for processing mapped data were developed in conjunction with these efforts. *Hydrilla*, *Zizaniopsis* and *Myriophyllum* were the subject plants.

WATER QUALITY AND AQUATIC VEGETATION IN THE BACK RIVER RESERVOIR BERKELEY COUNTY, SOUTH CAROLINA. L.H. Lagman; F.P. Nelson; G.E. Richardson. 1980. Report -130, Water Resources Commission, State of South Carolina, 3830 Forest Drive, P.O. Box 4515, Columbia, South Carolina, 29240. 62 pages.

Back River Reservoir is an important source of water for municipal, industrial and recreational users in the Charleston, South Carolina area. This document examines the existing water quality and aquatic plant communities of the reservoir. *Alternanthera philoxeroides*, *Ludwigia uruguayensis*, *Hydrocotyle ranunculoides* and *Egeria densa* have been identified as its primary nuisance aquatic plant species.

NATURFORHOLDENE I VEJLERNE EN BESKRIVELSE AF UDVIKLINGEN I DET VIDENSKABELIGE RESERVAT VEJERNE I 1900-ARENE. Fredningsstyrelsen. Forskningsrapport nr. 17 fra naturreservaterne. Miljøministeriet, Copenhagen. 108 pp. (In Danish)

"This report describes the development and the changes in the habitats, flora and fauna of the Danish nature reserve 'Vejlerne' in North Jutland." One of the largest and most important Danish wetlands, Vejlerne was subject to land reclamation/drainage attempts which apparently reduced its submersed flora leading to a reduction in its waterfowl population. Present commercial use of the areas, including reed-harvesting and cattle production, is described.

INVESTIGACION SOBRE APROVECHAMIENTO DE MALEZAS ACUATICAS EN LA REESTRUCTURACION DE SUELOS. [INVESTIGATION OF THE USE OF AQUATIC WEEDS IN THE RESTRUCTURING OF SOILS.] V.B. Ramirez, R.J. Contreras, A.M.D. Hernandez, J.L.R. Bustamente, N.G. Hernandez. 1980. Subdireccion de Investigacion y Entrenamiento, Departamento de Control y Aprovechamiento de Malezas Acuaticas, Mexico. 45 pp. (In Spanish)

This booklet reports on the experimental utilization of water hyacinths as a source of organic material for agricultural soils. The economics of manually harvesting, transporting, processing and incorporating the plant into the soil is presented.

PROCEEDINGS. POCOSINS: A CONFERENCE ON ALTERNATIVE USES OF THE COASTAL PLAIN FRESHWATER WETLANDS OF NORTH CAROLINA, January 3-4, 1980. Sponsored by: Integrated Case Studies Program in Natural Resources Analysis, Duke University School of Forestry and Environmental Studies, and others. 1981. Hutchinson Ross Publishing Company, Stroudsburg, Pennsylvania. 364 pages.

Pocosins are freshwater wetlands which occur in the coastal plain from Virginia to north Florida. Intensive development and management of the pocosins prompted the conference "as the first step in understanding the benefits, costs and risks associated with the conversion of large tracts of North Carolina wetlands and in developing integrated management guidelines for these threatened and valuable natural resources." This collection of 24 presentations is divided into five sections including: Resource Ecology, Nonindustrial Values, Industrial Values, Resource Economics and Law and Policy.



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BOOKS AND REPORTS

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measured by its weight increase. Among the author's conclusions: "It seems evident that the inability of hydrilla to thrive in Lake Starvation is, in part, the result of naturally occurring materials that are extracted from the sediment, though the mechanism of production of these materials is presently unknown."

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